



The oil-water separators ("Costner machines") BP plans to deploy in the Gulf were invented by INL chemist David Meikrantz 20 years ago. Credit: Flickr/NASA Goddard Photo and Video.

INL scientist's oil-water separator to help clean up Gulf oil spill

By [Mike Wall](#), INL Communications and Governmental Affairs

The enormous cleanup effort under way in the Gulf of Mexico is highlighting a frustrating, somewhat paradoxical truth: while oil and water don't mix, they can be awfully hard to separate.

But cleanup crews could soon start making more progress on the catastrophic BP oil spill, thanks to a 20-year-old invention by Idaho National Laboratory chemist David Meikrantz. [BP has purchased 32 oil-water centrifugal separators](#), machines based on technology Meikrantz patented back in 1990. The oil giant [plans to deploy](#) these separators throughout the Gulf.

"This technology is about cleaning the oil up before it gets to shore," Meikrantz says, "before those tar balls start washing up."



Oil from the BP spill is washing up on the beaches of every Gulf state. Credit: Flickr/USFWS/Southeast.

How it began

Meikrantz's initial work with centrifugal separators had nothing to do with oil or environmental remediation. Throughout his long and storied career — Meikrantz holds 16 U.S. patents, with seven more pending — he has done a lot of nuclear-energy research, and he began using the machines to separate out components of used nuclear fuel.

Then, in January 1988, an [Ashland Oil storage tank burst](#) in Floreffe, Pa., a few miles from Pittsburgh. Nearly a million gallons of diesel flowed down a storm drain and into the nearby Monongahela River. The spill contaminated the drinking water of about a million people. Thousands had to be evacuated as the disaster dragged on.



"At the time, I wondered, 'Why don't they just clean it up?'" Meikrantz says. "Then I realized they couldn't. That's when I started thinking about using this technology to help clean up oil spills."

[Centrifuges](#) separate substances based on their differing densities. Since oil is famously lighter than water — it forms slicks atop puddles and seas, after all — Meikrantz's idea made perfect sense. He modified a centrifuge he'd been using in his nuclear research, repurposing it to separate oil and water.

It worked, and Meikrantz patented the technology in 1990.

INL chemist David Meikrantz [demonstrates](#) how his oil-water separator works, using a small version of the machine.

Technology gains attention

The invention soon caught the eye of the actor Kevin Costner. Like Meikrantz, Costner was profoundly affected by an oil spill. The [Exxon Valdez disaster](#), which dumped 11 million gallons of crude into Alaska's Prince William Sound in March 1989, [inspired the actor](#) to find, or develop, effective oil-spill cleanup technology.

"He's quite passionate about this," Meikrantz says. "His dream was to be able to make a difference."

Costner and his brother formed a company, Costner Industries Nevada, Inc. (CINC), with this purpose in mind. CINC licensed Meikrantz's invention in 1993 and began developing commercial versions of the oil-water separator. In 1994, Meikrantz joined CINC to help the process along, becoming the company's technology director.

CINC eventually came up with several different separator models. All were effective in laboratory trials, separating oil and water as well as various other substances. Over time, the machines found broad application in many fields. Industry employs them, for example, to make pharmaceuticals and chemicals and to help extract precious metals from ore.

But the separators didn't see much field deployment against oil spills, because the U.S. didn't suffer any Valdez-like calamities for a long while.

"It takes a big spill to really test this technology out," says Meikrantz, who came back to INL in 2003.

The next big spill

A large-scale test could happen with the ongoing disaster in the Gulf of Mexico. In mid-June, BP confirmed that it had bought — after extensive and successful testing — 32 oil-water separators from [Ocean Therapy Solutions](#), a new company Costner co-founded in the spill's aftermath. The machines are still based on the technology Meikrantz patented 20 years ago.

The separators BP purchased are the [V20 model](#), which stands about 10 feet tall and weighs two tons. Oily water comes into the machine's cylindrical central chamber, then gets spun at about 1,200 revolutions per minute. Water hugs the outside of the chamber and exits via one pipe; the less-dense oil stays in the middle, then gets shunted out through a different tube. It can be collected, processed and eventually sold.

Each V20 could potentially clean about 200,000 gallons of water per day. According to Meikrantz, the machines could stud the decks of many different types of ships, including fishing boats.

"You separate the oil and water right away, in real time," he says. "Tank the oil, and return the water directly to the ocean."

Turbo-boosting the separation process

The V20 can make oily water more than 99.9 percent pure, reducing oil concentrations to about 50 parts per million. But Meikrantz says another invention of his could help get that number even lower.

In the V20's cylinder, small amounts of oil and water inevitably cling together during the spin, resisting separation. In 2006, Meikrantz patented a technique that blasts apart these stubborn hangers-on with microwaves.



Oil-skimming vessels ply the Gulf of Mexico. Credit: Flickr/DVIDSHUB.

on."

Planning ahead

Meikrantz hopes his invention can help remediate the Gulf oil spill, which is shaping up to be one of the worst environmental disasters in the nation's history. But he's not satisfied, and he's not standing still, as his efforts to improve the oil-water separator show.

"I hope we don't have another big spill," Meikrantz says. "But we still need to be ready."

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A V10 model oil-water separator. The V20 — which BP purchased — is similar but bigger, standing 10 feet tall and weighing two tons.

"Microwaves add a little turbo boost," he says. "They can give us higher throughput and higher efficiency."

Souped-up separators would be better at cleaning up oil spills, or making pharmaceuticals, or extracting precious metals. And they could help make oil production easier and more profitable, Meikrantz says. Many of the oil deposits now being drilled around the world are highly impure, containing up to 40 percent water. Separating that oil out using current methods is difficult, expensive and time-consuming. A bank of microwave-enhanced V20s could do the job quickly and with little fuss, right on the drilling site.

The V20's performance during the Gulf cleanup operation could attract more attention to Meikrantz's original invention, perhaps spurring commercial interest in the microwave-enhanced version. Meikrantz hopes to build a prototype soon.

"It'd be very easy to test," he says. "It's the same centrifuge, with or without the microwaves turned